



Profile: Fall Injury

Hawai'i Department of Health
Injury Prevention & Control Program

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Overview of presentation

- **Fatal falls**
 - *Comparisons w/ rest of U.S.*
 - *Local description*
 - *Causes—limitations of data*
 - *Leading cause of injury-related death among seniors*
- **Non-fatal injuries from falls among seniors**
 - *Hospitalizations—statewide*
 - *EMS data—Honolulu county only*
 - *More detailed study of EMS reports*

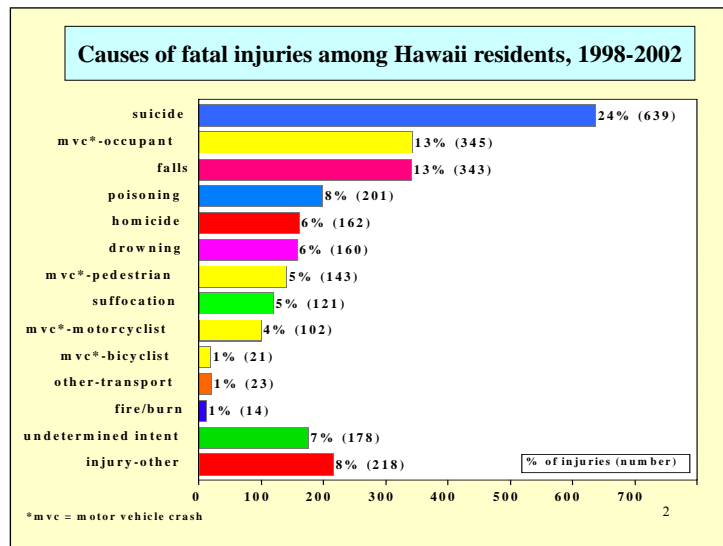
This report presents information about fatal falls, including how falls rank with respect to other causes of fatal injuries, and shows how the fatality rates for Hawai'i compare to those for the rest of the U.S. Characteristics of fatal falls, including age and gender, are described.

Limitations of the data in describing the causes of fatal falls are addressed.

Falls are a particular problem to senior-aged residents, and a major part of this report focuses on falls among the elderly.

Information on non-fatal fall-related injuries is also presented, based on hospitalization data for the state. More detailed data gathered by reviewing O'ahu EMS reports for fall-related injuries among seniors on O'ahu are subsequently discussed.

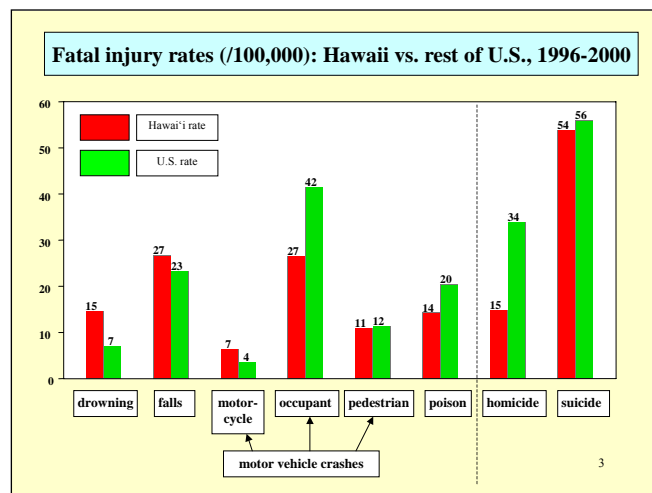
Data on the leading causes of fatal injury to Hawai'i residents over the 5-year period of 1998-2002 show suicide as the most frequent cause, accounting for almost one quarter of all fatal injuries. Motor vehicle crashes account for almost as many injury-related deaths.



These are broken down into four main categories: deaths of car occupants (second overall), pedestrian deaths, motorcycle crash-related deaths, and -- to a lesser extent -- fatally injured bicyclists.

There were nearly as many deaths due to falls as to car crashes. Poisoning was the fourth leading cause, followed by homicide and drowning.

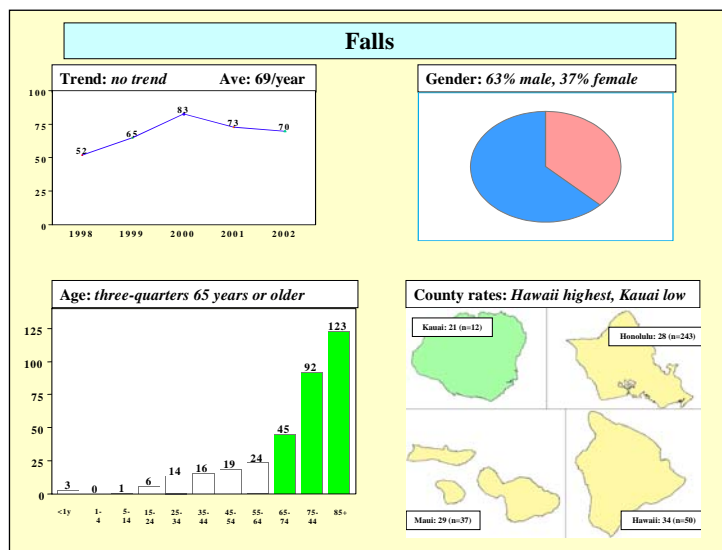
The Hawai'i-U.S. rate comparisons are broken down by eight injury areas of interest. On the left side of the graph are the six unintentional injury categories of drowning, falls, motorcycle crash, motor vehicle occupant injury, pedestrian injury, and poisoning; on the right are the intentional injury categories (i.e., homicide and suicide).



The rate of drowning in Hawai'i is high, relative to the rest of the U.S. Hawai'i has the second highest drowning rate in the country -- second to Alaska. Falls are slightly higher in Hawai'i, and the rate of fatal motorcycle crashes in Hawai'i is almost

twice that for the rest of the U.S. This might be because the weather in Hawai‘i allows people to ride all year long, widening the window of exposure and risk.

Fatality rates among car occupants are much lower in Hawai‘i compared to the U.S., and this difference accounts for most of the overall difference in unintentional injury rates. Pedestrian fatalities occur at about the same rate, while poisoning is lower in Hawai‘i, compared to the rest of the U.S.

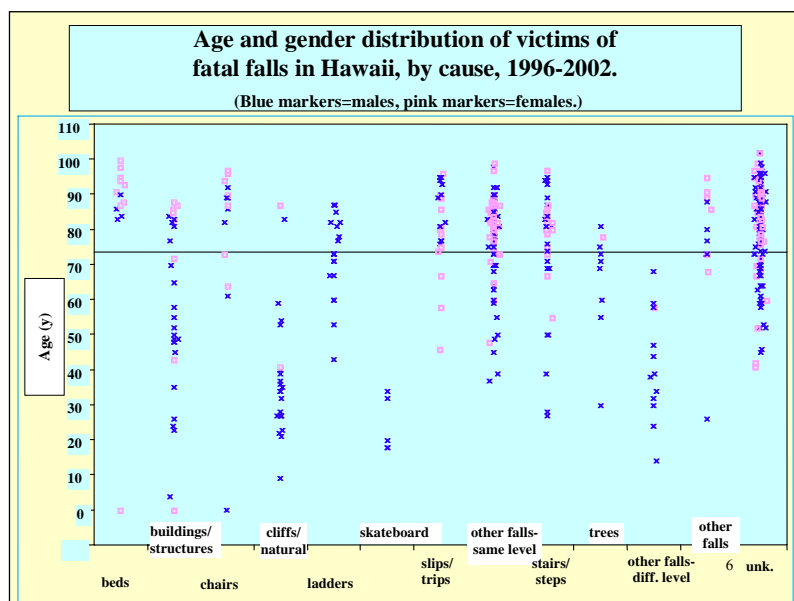
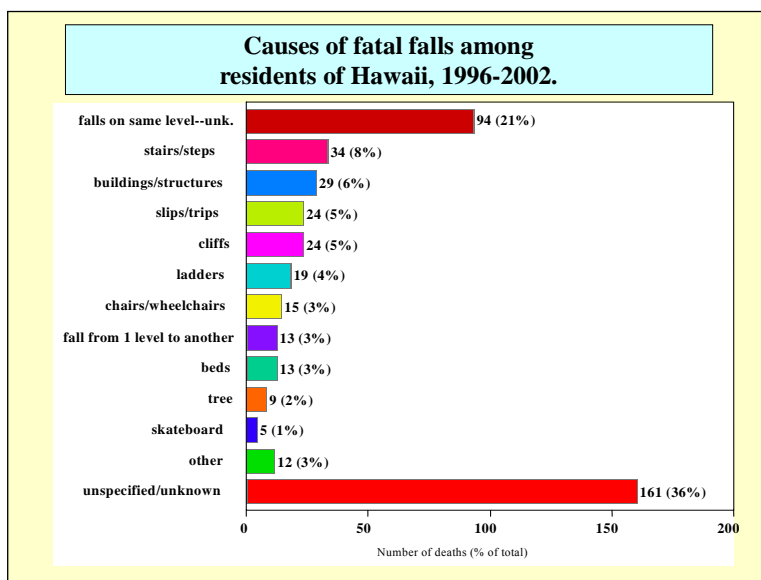


There was no trend in the annual number of fatal falls among state residents. (On average, 69 residents a year die through falls.) Male victims outnumbered females by about 2-to-1. Three-quarters of the victims were 65 years or older, and nearly two-thirds were 75 years or older.

The risk of fatal falls increases dramatically across these older age groups. Rates among residents aged 85 years and older, for example, are 21 times higher than rates among 65- to 69-year-olds.

The rates for Honolulu, Maui, and Hawai‘i Counties were very similar; the lowest rates were computed for residents of Kaua‘i. There were no significant differences between county rates.

More than half of reported falls were attributed to general causes: falls on same level (unk.) or unspecified/unknown. According to the more specifically coded death records, stairs and steps were the most common cause of fatal falls. Other frequent causes were falls out of buildings, due to slips/trips, and off cliffs.



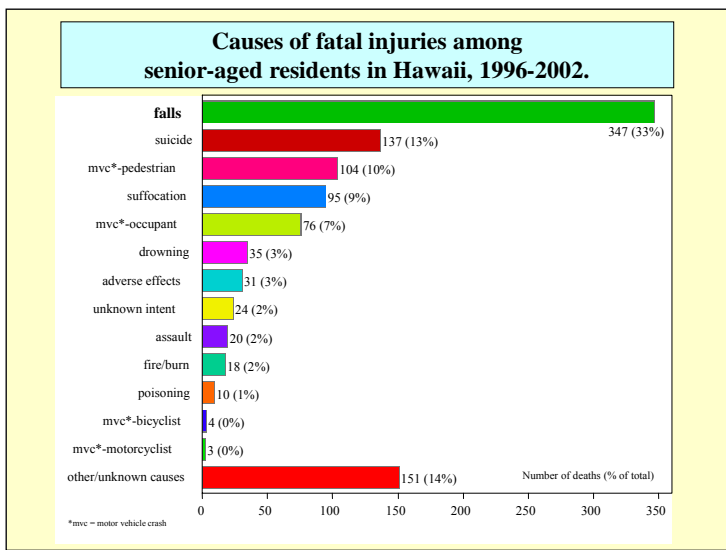
The age and gender distribution of victims can be different, depending on the type of fatal fall. The fatalities described by the graph are categorized by the cause of the fall.

Almost all the fatal falls from beds

occurred to victims aged 85 years or older. Most of them were women. In contrast, most of those who had fallen from cliffs or natural elevations were relatively young; most of them (75%) were 40 years of age or younger, and almost all (92%) were males. Similar patterns were seen for victims of fatal falls from skateboards and falls from other levels.

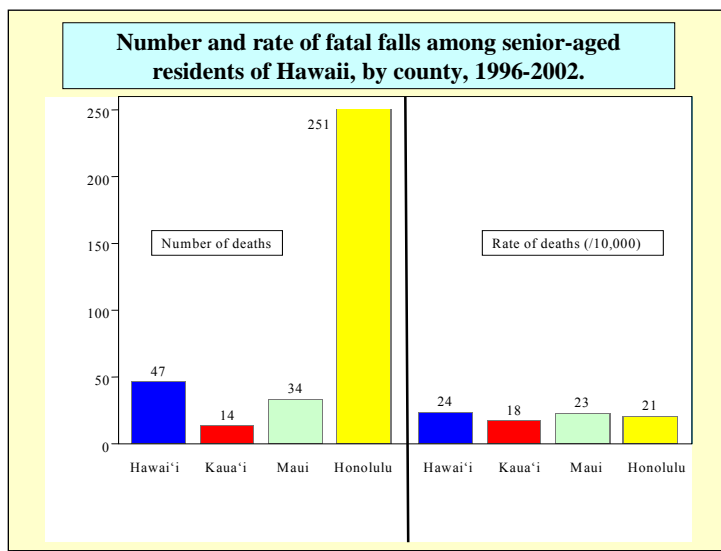
Overall, about one-third of the victims were females, but the gender distribution was much more even in the senior-age range (45% females).

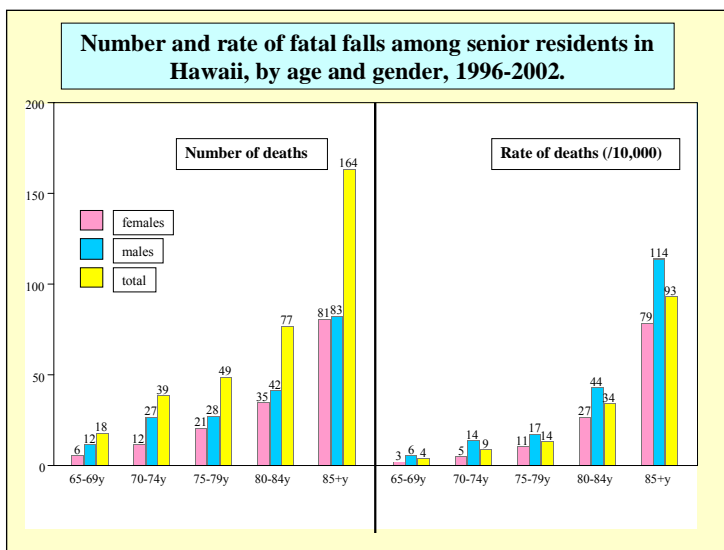
Of 1,055 total fatal injuries among senior residents over the 7-year-period, 33% were due to falls. In comparison, 4% of all fatal injuries specific to residents younger than 65 years of age were due to falls.



Almost three quarters (72%) of fatal falls to seniors occurred to residents of Honolulu County. Hawai'i and Maui counties reported about one quarter of the total, and 5% (14 deaths) occurred among senior residents of Kaua'i County.

The lowest fall fatality rate (18/10,000 seniors) was computed for Kaua'i County, after adjusting for population. The rate was between 21 and 24 for the other counties, although none of the county rate estimates were statistically different from each other. It should be noted, however, that Neighbor Island rate estimates are made with small numbers and may therefore be unreliable.



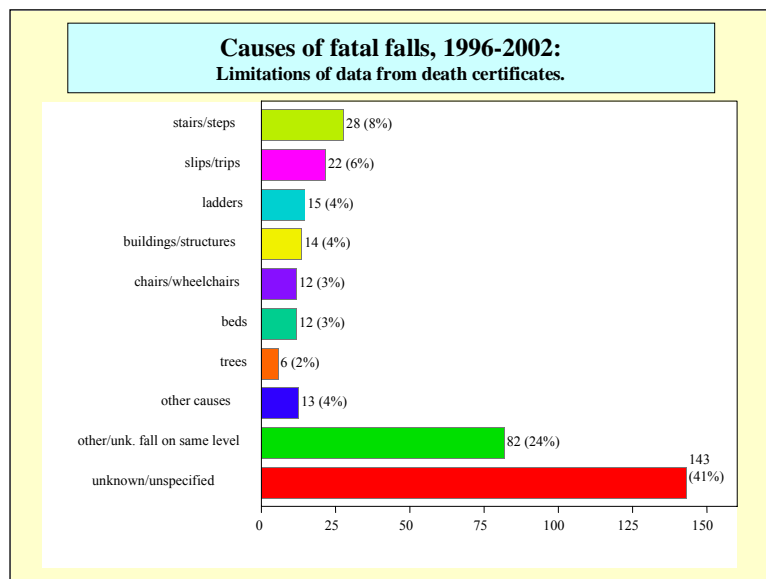


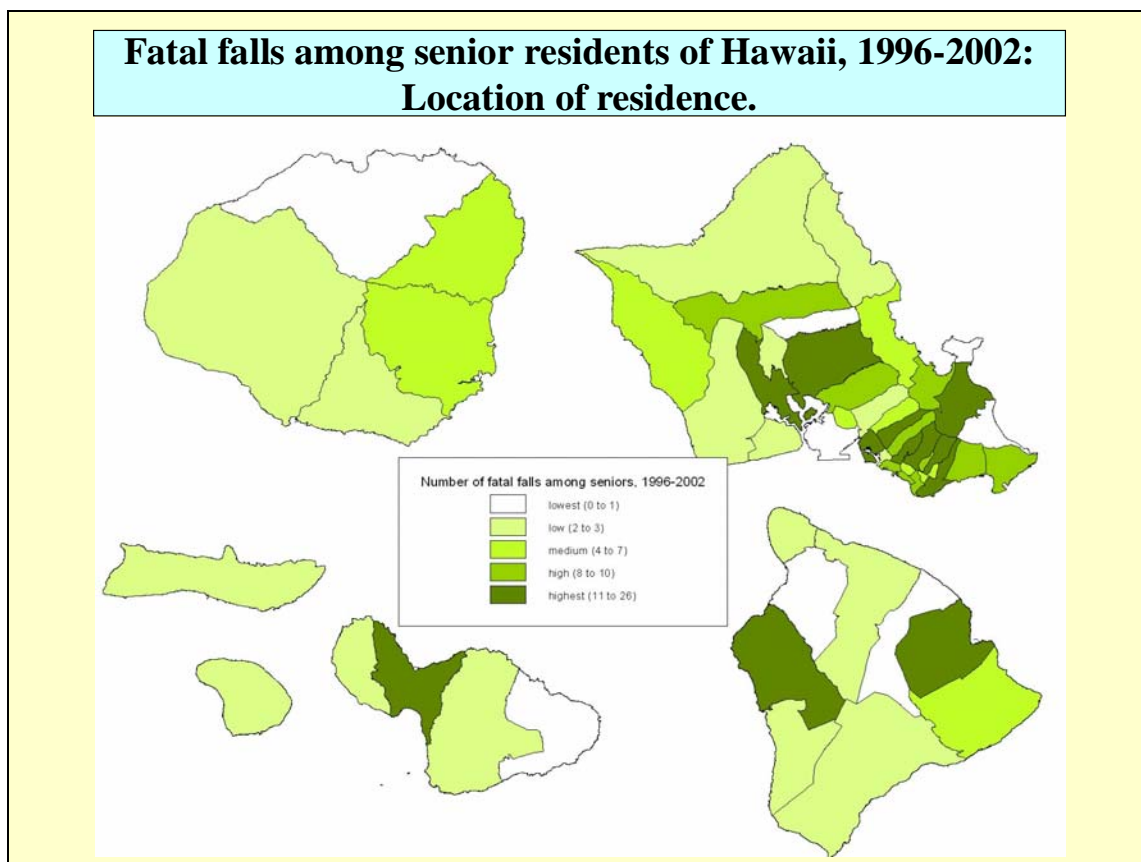
Both the number and rate of fatal falls among senior-age residents increased steadily with age. Almost half of the fatally injured seniors were 85 years or older. The rates show a non-linear increase with increasing age. Rates among residents aged 85 and older are more than 20

times higher than rates among seniors aged 65-69 years.

Overall, 45% of the victims were female and 55% were male. The disparity in the number of deaths decreased, however, with increasing age until the numbers were nearly equal at the 85+ year age group. Male rates were higher at every age (i.e., at least 30% higher in each age group), even in the 85+ year age group.

The vague category of unknown/unspecified cause of fatal fall was attributed with 41% of the deaths. Among the more specifically coded deaths, stairs and steps were the most common cause of fatal falls. Ladders; buildings; chairs, wheelchairs, or beds; and trees were other causes of fatal falls to seniors.

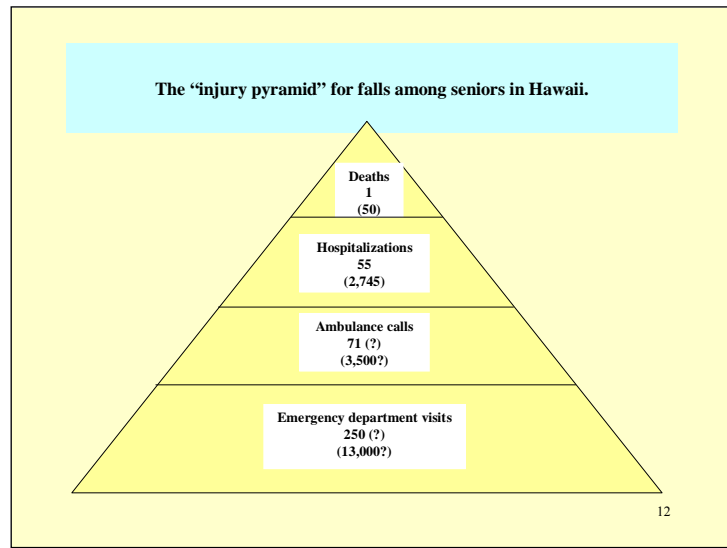




In general, residences of senior victims of fatal falls were concentrated on O‘ahu, specifically in the metropolitan Honolulu area or in the central O‘ahu areas of Waipahu and Pearl City. There were also high numbers in the urbanized areas of Hawai‘i County (i.e., Hilo and Kailua-Kona) and in the Wailuku district of Maui.

The Injury Pyramid is a tool illustrating injury severity concepts. It indicates that fatalities represent only a small proportion of all fall-related injuries.

In Hawai‘i, for every senior who dies from a fall, there are an estimated 55 hospitalized and an estimated 250 seen in emergency departments, where perhaps one quarter are received via ambulance.



Data for statistics on hospitalization come from records of hospital admissions collected by the Hawai‘i Health Information Corporation. Since not all hospitals in the state E-code, these data represent only about 50% of all such admissions. Since the extent of E-coding varies by county and within counties over time, it is difficult to analyze differences in hospitalization or trends over time at the county level.

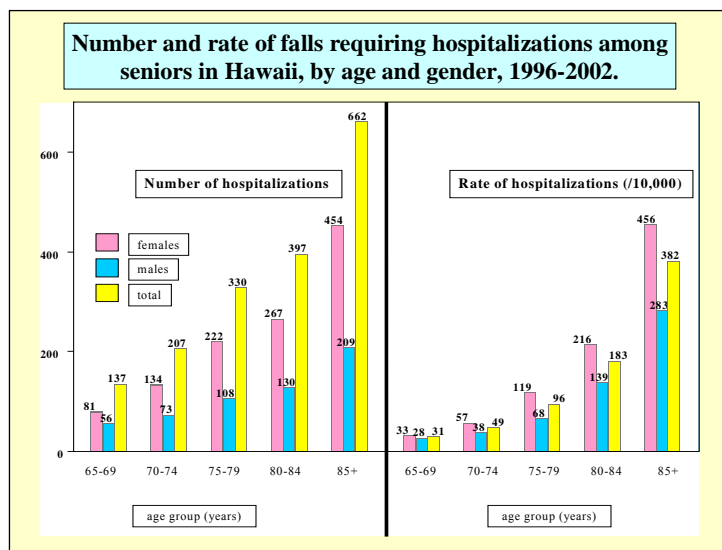
Hospitalizations for injuries from falls among seniors in Hawaii, 1996-2002.

- **1,734 E-coded falls or hip fractures per year (~2,585 actual?)**
 - *Almost all (94%) of femur fractures are caused by falls*
- **Number and rate increases with age**
 - *Rates among 85+ year-olds 12 times higher than 65-69 year-olds*
- **Mostly (67%) female**
- **Geographic location (femur fractures):**
 - *Highest numbers on Oahu, urban parts of Neighbor Is.*
 - *Highest rates in urban Honolulu/east Oahu*

An average of 1,734 hospitalizations due to injuries from falls were identified by E-codes which explicitly state the reason for hospitalization as a fall (856) and by including non-E-coded hospitalizations due to hip fractures (874). (Falls cause 94% of all femur fractures among seniors in the

state and 95% of all fractures of the neck of the femur.) If complete E-coding were assumed, that total could be 2,585 such hospitalizations a year. (E-coding among senior patients is 50.25%.)

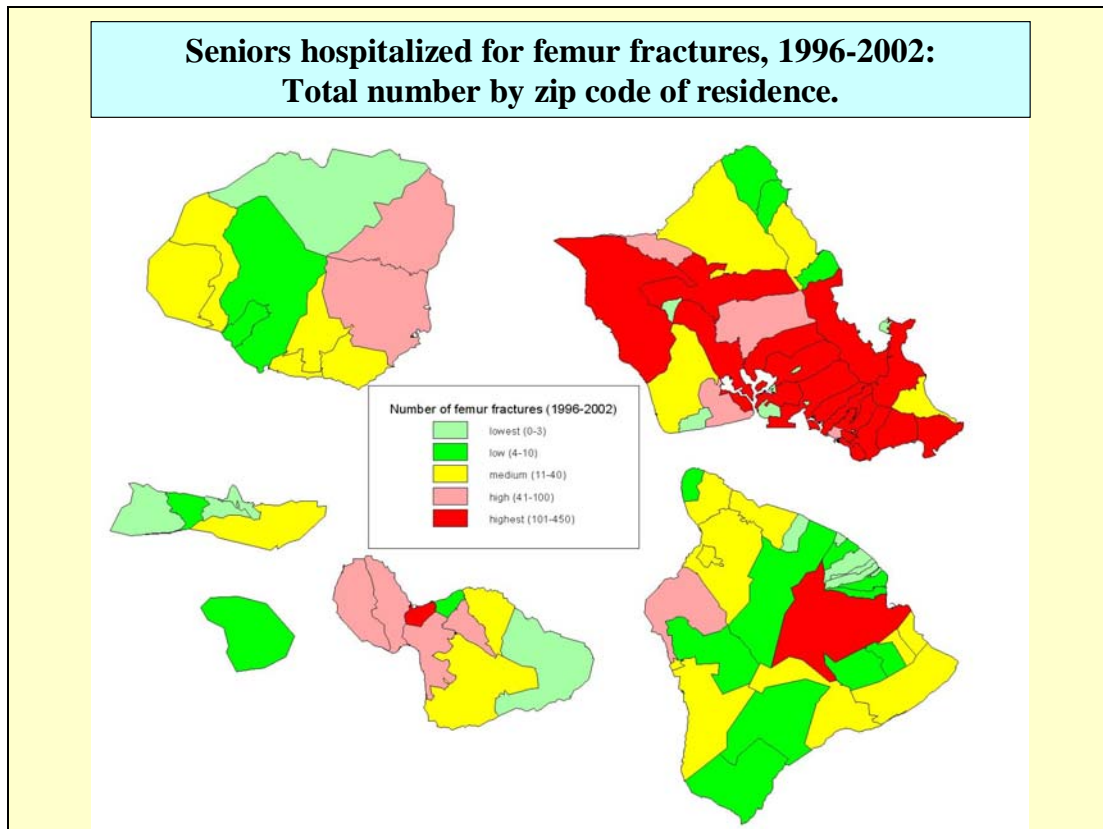
With respect to fatal falls, the number and rate of hospitalization increased dramatically over the senior age range. For example, rates among seniors aged 85 years and older were 12 times higher than rates among 65- to 69-year-olds. About two-thirds of the patients were females.



The annual number of hospitalizations of seniors due to non-fatal falls is shown on the left part of the graph, and the rate of hospitalization is shown on the right. The figure includes the age and gender distribution of the hospitalized seniors.

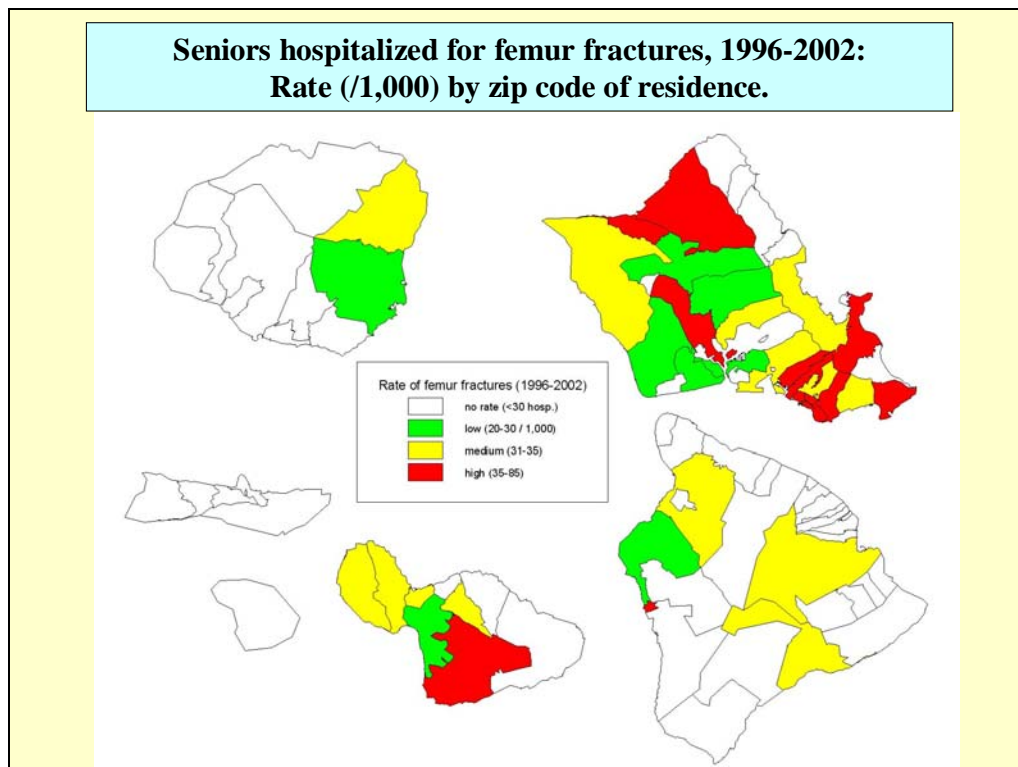
Both the number and rate of hospitalization increased steadily with age. More than one third (38%) of the patients were 85 years or older. The rates on the right side of the illustration show a dramatic rise with increasing age; rates among residents aged 85 and older are more than 12 times higher than rates among seniors aged 65-69 years.

The number of female patients is almost double the number of males at nearly every age, and the rates of hospitalization among senior-aged women are also higher, particularly at the later ages. This is different from what was described for fatal falls which occur more frequently to men.



The map shows the locations of residence of the patients hospitalized due to a fractured femur, by zip code area. In general, the highest numbers were on O‘ahu and the urbanized parts of the Neighbor Islands (i.e., Hilo and Kailua-Kona on Hawai‘i Island, Wailuku on Maui, and Līhu‘e and the Kapa‘a areas of Kaua‘i.) Of the 15 zip code areas with the highest total number of residents hospitalized, 14 were on O‘ahu; the exception was Hilo (5th overall).

As expected, places with higher populations of senior residents (such as Honolulu or urbanized parts of the Neighbor Islands) report higher numbers of senior residents who are hospitalized. If we want to assess risk, however, we need to consider rates.



Rates of hospitalization due to femur fractures were calculated after adjusting for the number of senior residents in each zip code area. To compute a reliable rate, at least 30 data points (i.e., hospitalizations) are needed. More than half (62%) of the zip code areas are not eligible for rate calculation.

Most of the areas with higher rates are in the urbanized Honolulu area, including Downtown, Ala Moana, Nuʻuanu, Waikīkī, Kahala and Hawaiʻi Kai.

On the Neighbor Islands, only the Kula area of Maui and Kealahou on Hawaiʻi Island were reported with high rates, although there were too few hospitalizations to compute rates in many of the areas.

There were no wide differences in overall county rates for these hospitalizations:

<i>County</i>	<i>No. Hospitalizations</i>	<i>Rate/1,000</i>
Hawai'i	687	35.26979
Honolulu	4,273	36.08835
Kaua'i	261	32.64774
Maui	469	32.18785

**Hospitalizations for injuries from falls
among seniors in Hawaii, 1996-2002. (cont.)**

- **Causes of falls**
 - *Mostly unknown—even with E-codes*
- **Types of injuries**
 - *Most (75%) sustained fractures (femur: 50%)*
 - *Contusions (15%), internal injuries (10%), open wounds (8%)*
 - *Traumatic Brain Injury (TBI): 10%*
 -
- **Other statistics:**
 - *Long stays: 46% 1 week or more, 5% died in hospital*
 - *Average hospital charge: ~\$21,000 (not incl. MD charges)*
 - *~\$55 million/year*
 - *74% paid by Medicare*

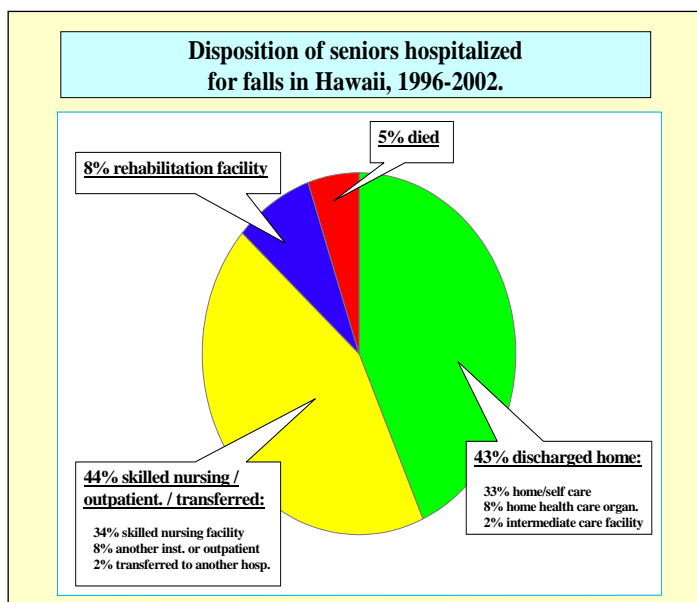
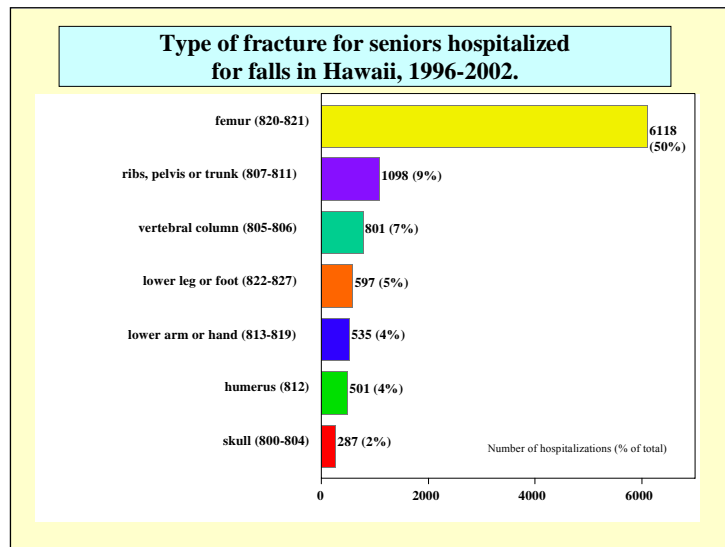
Hospitalization data generally do not tell us much about the causes of the falls. This is because many of the records are not E-coded and also because some of the E-code categories are too general or vague. Among the E-coded records, over half the falls were coded as “other or unspecified” causes.

As for the type of injury, most (75%) of the patients suffered fractures, and half were diagnosed with a fracture of the femur. There were fewer numbers of contusions, internal injuries and open wounds. About 10% of the patients suffered a Traumatic Brain Injury (TBI) through a fall. Falls were the leading cause of TBI among seniors in Hawai'i, contributing to 84% of TBI of known origin¹. In fact, falls among seniors was the leading cause of TBI in the state, even if patients of all ages are included for other causes. For example, there was an annual average of 180 seniors hospitalized for TBI from falls, compared to 155 TBI cases from car crashes among patients of all ages. Falls among seniors account for nearly one quarter (23%) of all hospitalizations for TBI in the state.

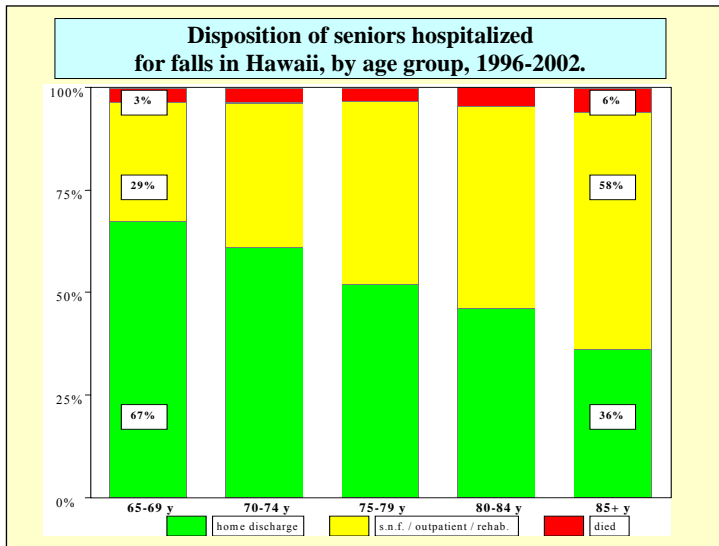
¹ The cause of TBI was unknown in 39% of the cases, due to incomplete injury coding of hospital records.

With respect to length of stay and costs, about half of the patients were admitted for a week or longer, and 4% stayed for at least a month. Hospital charges averaged more than \$21,000 per hospitalization. This estimate does not include physician charges, which might double that charge estimate. Total hospital charges average about \$55 million a year in the state, and most of these charges (74%) are paid by Medicare.

The most common type of fracture resulting from non-fatal falls is fracture of the femur. Half of all senior hospitalizations subsequent to falls were due to fractured femurs. The frequencies of other types of fractures were not as high.



Fewer than half of seniors hospitalized due to a fall or a femur fracture from 1996 to 2002 (43%) were ultimately discharged to home. An equal proportion (44%) were discharged to another care facility, most frequently a skilled nursing facility. About 8% were discharged to a rehabilitation facility, and 5% died in the hospital.



The patient's age appeared to influence the outcome. Disposition status (i.e., outcome) was classified into five patient age groups: 65 to 69 years, 70 to 74 years, 75 to 79 years, 80 to 84 years, and 85+ years. Outcomes progressively worsened with increasing age. As the proportion of discharges home decreased, the proportion of follow-up care and death increased with advancing age. For example, two-thirds of the patients 65-69 years of age were discharged home, 29% were referred to skilled nursing or rehab, and 3% died. In contrast, among the oldest patients, the proportions were almost reversed; only about one-third were discharged home, 58% were referred to skilled nursing or rehab, and the proportion of deaths doubled to 6%. This supports the belief that the age of the patient affects the prognosis after a fall.

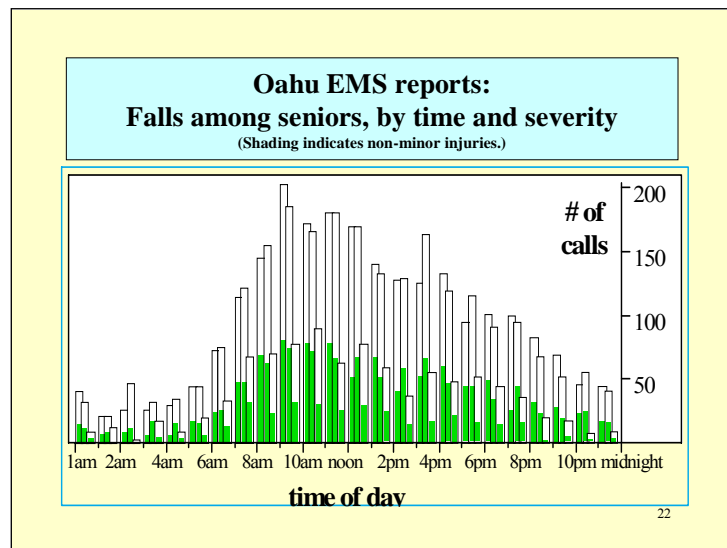
**Oahu EMS ambulance reports:
Falls among seniors, 1995-1998.**

- **Large study**
 - Dispatch level data
 - computerized
 - 5,744 records
- **Sub-study**
 - Narrative of ambulance report
 - manual review
 - 481 records

were randomly selected for manual review. The EMS narrative section provided information for classification of the causes of falls and to allow abstraction of other information.

Death certificates and abstracted hospital admission data do not provide enough information on the causes of falls among seniors. To obtain more detail, a study of EMS records on seniors who had suffered falls on O'ahu from 1995 to 1998 was conducted. Of 5,744 cases, 481 records

The time of day that EMS received the emergency call for senior fall victims is an estimate of the time of occurrence of the fall. The green shading in the graph indicates the proportion of injuries graded as “serious” or worse.

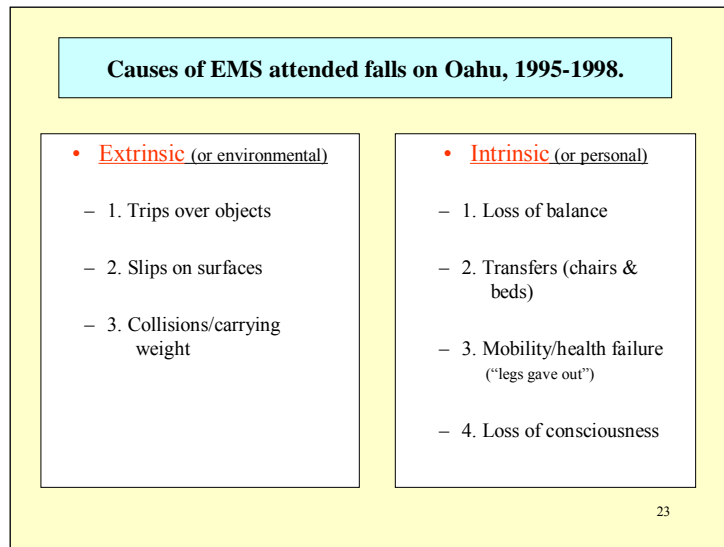


Although falls occurred at all hours of the day, there was a peak in the mid-day hours. More than one-third of the injuries occurred between 9:00 a.m. and 1:00 p.m., and more than one-half (3,130) occurred between 9:00 a.m. and 4:00 p.m. Only 13% occurred between 10:00 p.m. and 5:00 a.m.

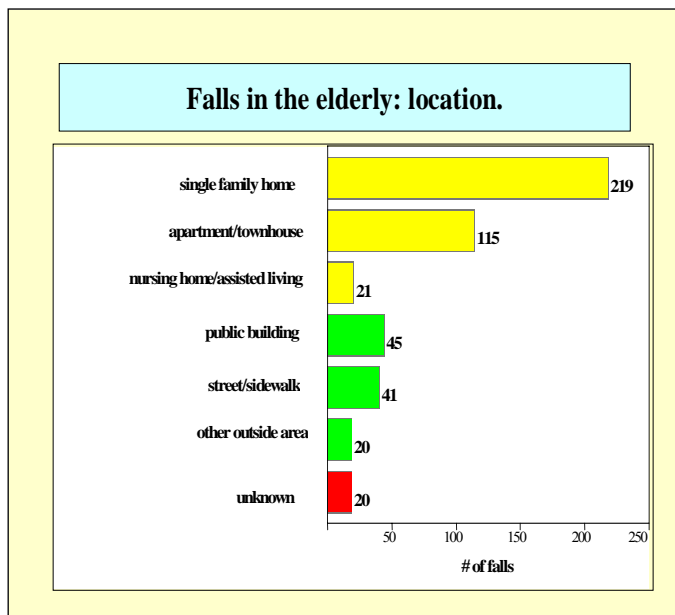
There appeared to be no relation between the time of day and the severity of injury, as the green part of this graph (indicating higher severity) shows the same general shape as the white part (indicating injuries of “minor” severity).

Leading causes of EMS-attended falls on O‘ahu may be classified into two main categories: extrinsic (or environmental) causes and intrinsic (or personal) causes.

Examples of extrinsic factors are an electric cord posing a risk of tripping and a wet bathroom floor where someone may slip. Intrinsic factors are related to the person, such as weakness in the legs or a loss of balance.



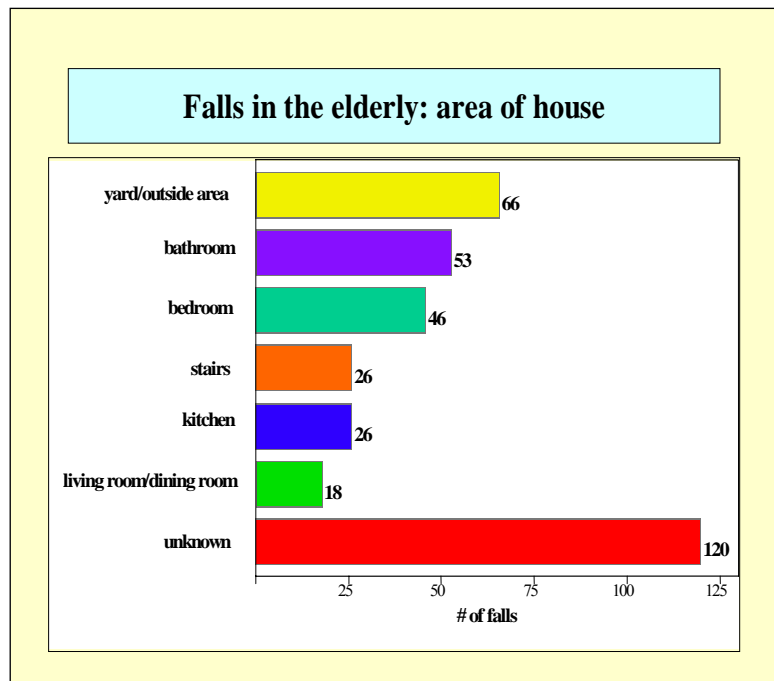
Through the study of EMS records, the most important extrinsic factors were found to be uneven surfaces, especially stairs, and objects on the floor. Circumstances causing slipping were the next most common, followed by collisions with other people or objects, or falling while carrying heavy objects.

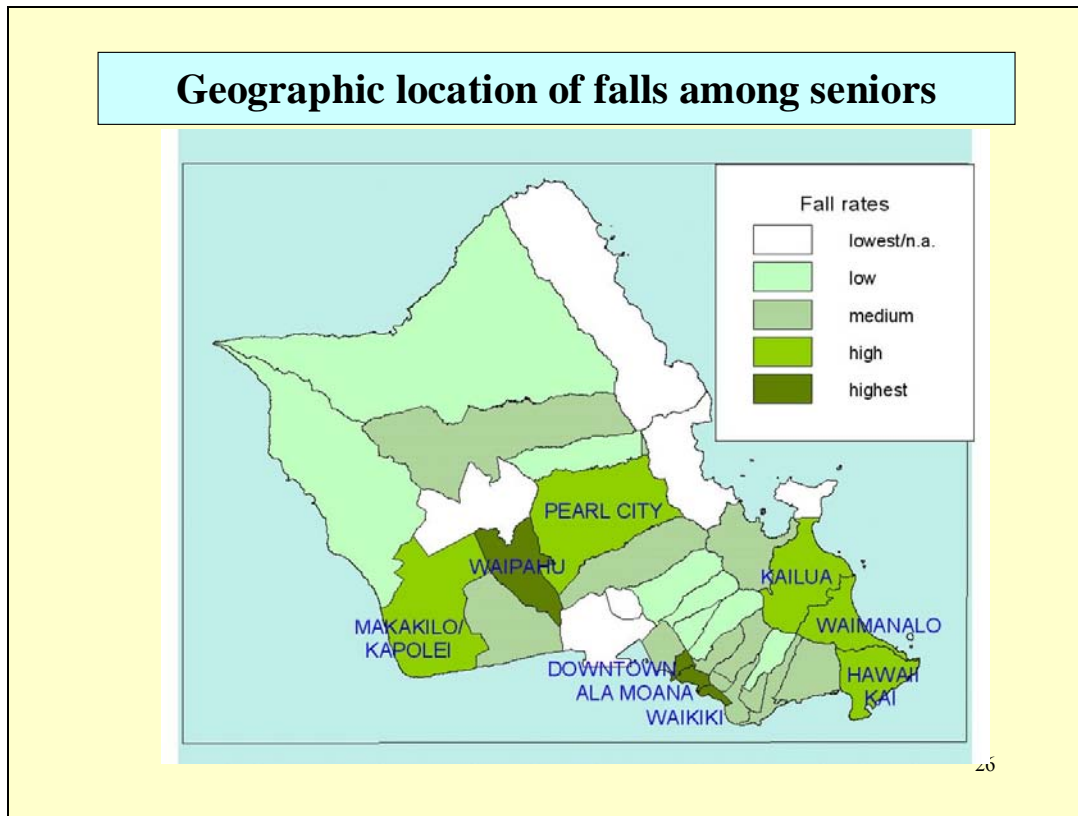


The most important intrinsic factor was loss of balance by the patient. Circumstances associated with getting up from chairs or out of bed were the second most common intrinsic factor. Some patients experienced mobility problems or health systems failure (e.g. “my legs gave out”), and loss of consciousness sometimes preceded falls.

About three-fourths of all falls occurred in the home environment. However, significant numbers of falls occurred both in public buildings and on streets and sidewalks.

Information on room location of falls that occurred at home was not available for 120 of the patients, or about one-third of the total (355). Where information was available, the most common place of fall occurrence was in the yard or otherwise outside the residence. Inside the house, the most common areas were the bathroom and the bedroom, followed by the kitchen and areas with stairs.





Fall rates by the 32 Neighborhood Boards on O‘ahu were calculated based on EMS responses to calls. Since there were over 5,700 of these calls, there was a big enough sample to adjust for population differences across the neighborhoods. The three highest rates were computed for the Ala Moana, Downtown, and Waikīkī areas. The 4-year rates for all three of these neighborhoods were higher than 100/1,000. That means that over the 4-year period, more than 1 in 10 senior residents in these areas suffered a fall-related injury that required an ambulance.

Rates were also high in three central areas (i.e., Waipahu, Pearl City, and Kapolei) and in three neighborhoods on the east side of O‘ahu: Kailua, Waimānalo, and Hawai‘i Kai.

Data summary	
Who?	Risk increases with age Men: higher death rates, women hospitalizations
Where?	Deaths: no significant county differences Hospitalizations (femur fractures): generally higher rates in urban Honolulu
When?	Mostly daylight hours; esp. mid-day
Why?	Poor information for fatalities and hospitalizations. EMS data: Most probably multi-factorial causes; importance of intrinsic and extrinsic factors

Summary of research on falls in the elderly

The risk of falling increases dramatically with age among people 65 years and older. Men are at a higher risk of fatal falls, but women are at a higher risk of falls (usually non-fatal) requiring hospitalization .

There were no significant differences in rates of fatal falls by county, but those comparisons are somewhat limited by the relatively small sample size. For hospitalizations, the highest rates of femur fractures were generally found in the urbanized parts of O‘ahu, although these comparisons are also limited.

According to EMS records, most falls occur in daylight hours. More than one-half of the EMS-attended falls on O‘ahu occurred between 9:00 a.m. and 4:00 p.m. Only 13% occurred between 10:00 p.m. and 5:00 a.m.

The manual review of EMS records indicated that the causes of most falls are probably multi-factorial in nature. Causes can be both extrinsic (i.e., environmental) and intrinsic (i.e., related to the person). The impact of intrinsic factors on seniors may be reduced by improving their balance and general strength, providing them with regular vision checks, and monitoring their medicines to ascertain which ones or combinations may cause dizziness and lead to falls.

**General recommendations to
reduce the risk of falls
among seniors**

Most of the strategies to reduce the risk of falls are best accomplished, or at least initiated, in the clinical setting with a physician visit as the starting point.

Fall prevention

- **Maintain/begin a regular exercise program**
 - balance and strength
- **Review medications with your doctor**
- **Have your vision checked regularly**
- **Maintain a safe, hazard free home**
 - decrease clutter, install grab-bars, etc.

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Many experts now believe it is necessary to maintain good physical health in order to prevent falls. Regular exercise can build and maintain strength and balance, two personal factors that are key in preventing falls.

As with many prevention strategies, it is important to consult with the doctor. In particular, it is good to review the medications being taken, since many of them, particularly psychotropic medicines, are known to cause dizziness and lead to falls. Maintaining good vision is another important way to prevent falls. Finally, it is prudent to maintain a safe, clutter-free environment and to install safety features as appropriate, such as grab bars in the bath area.